

# PATENT ABSTRACTS OF JAPAN

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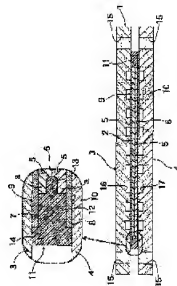
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## (54) ELECTRODE UNIT FOR PHOSPHORIC ACID FUEL CELL

### (57)Abstract:

PROBLEM TO BE SOLVED: To prevent exudation of phosphoric acid to the outside and evaporation of water in phosphoric acid.

SOLUTION: An electrode unit for a phosphoric acid fuel cell 2 is provided with an electrolyte 6 of heat resistant resin matrix 5 impregnating phosphoric acid, an air electrode 9 and a fuel electrode 10 having circular protruding parts 7, 8 interposing the electrolyte 6 and positioned outside the outer circumference edge of the electrolyte 6, a seal member 11 interposed between the circular protruding parts 7, 8.



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the electrode unit for phosphoric acid fuel cells.

[0002]

[Description of the Prior Art]Conventionally, the thing which sandwiched the electrolyte which impregnated with phosphoric acid the resin matrix which has heat resistance as this kind of an electrode unit with the air pole and the fuel electrode, and made the peripheral part of that resin matrix extend from the periphery edge of an air pole and a fuel electrode is known. This extended part is used as a sealing member which is pinched among both separators and prevents the leak of hydrogen from between both separators, and air.

[0003]

[Problem(s) to be Solved by the Invention]However, under an operating temperature (about 200 \*\*) high in phosphoric acid exuding outside through the micropore which a resin matrix has, if the above means are adopted, Since there was a possibility that the moisture in the phosphoric acid which exists near a resin matrix surface may evaporate through said micropore and a high-cost resin matrix would moreover be used besides the original purpose, there was a problem that the increase in the amount used caused high cost-ization of an electrode unit.

[0004]

[Means for Solving the Problem]An object of this invention is to provide said electrode unit for phosphoric acid fuel cells which prevents extraction to the exterior of phosphoric acid, and evaporation of moisture in phosphoric acid, and enabled it to control high cost-ization.

[0005]An electrolyte which impregnated with phosphoric acid a resin matrix which has heat resistance according to this invention in order to attain said purpose, The electrolyte is inserted and an electrode unit for phosphoric acid fuel cells provided with an air pole and a fuel electrode which have annular \*\*\*\*\* which exists outside a periphery edge of the electrolyte, and an annular seal member pinched between said annular \*\*\*\*\* is provided. "Annular" is synonymous with "endless form" and this is below the same as it at \*\*\*\*.

[0006]If constituted as mentioned above, the seal of the peripheral face of an electrolyte, therefore a resin matrix can be carried out by a sealing member, and extraction to the exterior of phosphoric acid and evaporation of moisture in phosphoric acid can be prevented. Since it is more possible than a resin matrix as a sealing member to use what consists of a low cost material, high cost-ization of an electrode unit can fully be controlled.

[0007]According to this invention, an electrode unit for phosphoric acid fuel cells in which a glue line which consists of tetra FUROORO ethylene, respectively exists between said sealing member and said both annular \*\*\*\*\* of said air pole and said fuel electrode is provided.

[0008]If constituted as mentioned above, said sealing effect can be raised further.

[0009]

[Embodiment of the Invention]In drawing 1 and 2, the cell 1 for phosphoric acid fuel cells consists of the plate-like electrode unit 2 of a flat-surface quadrangle, and the plate-like separators 3 and 4 of the flat-surface quadrangle of two sheets which sandwiches the electrode unit 2. The plate-like electrolyte 6 of the flat-surface quadrangle which impregnated with phosphoric acid the resin matrix 5 in which the electrode unit 2 has heat resistance. The electrolyte 6 is inserted and it has the annular seal member 11 which makes the frame form of the flat-surface quadrangle inserted between plate-like air pole (+) 9, and plate-like fuel electrode(-) 10 and both annular \*\*\*\*\* 7 and 8 of the flat-surface quadrangle which has annular \*\*\*\*\* 7 and 8 which exists outside the periphery edge of the electrolyte 6. In this case, what piled up the two heat resistant resin matrices 5 impregnated with phosphoric acid as the electrolyte 6 is used. The annular main body part 12 inserted between annular \*\*\*\*\* 7 and 8 as the annular seal member 11, What has the annular projection 13 inserted between the outer periphery parts a by which it was provided in the inner skin of the annular main body part 12, and in which both the resin matrix 5 carried out the compression set, and the outer frame part 14 which it is formed successively at the periphery side of the annular main body part 12, and is stuck to the peripheral face of the air pole 9 and the fuel electrode 10 is used. In this case, densification of the outer periphery part a of both the resin matrix 5 is carried out by a compression set, and it has sealing nature. When assembling a stack, the insertion hole 15 for inserting in a stacking bolt is formed in the four corners of both the separators 3 and 4, respectively.

[0010]The heat resistant resin matrix 5 is a polymer with the heterocycle structure which contains nitrogen at least, for

example, the poly membrane which consists of polybenzimidazoles. Such a thermally stable polymer film is indicated by the U.S. Pat. No. 5,525,436 specification, and various kinds of thermally stable polymer films indicated there are used in this invention.

[0011] Said thermally stable polymer film can fully be equal to the rise in heat by an electrode reaction. As phosphoric acid, the thick high thing (not less than 85%) of the boiling point is used, and under said rise in heat, the phosphoric acid is held at a poly membrane, and forms the medium of proton conduction. Since small size and a weight saving are attained, and the operating temperature is raised to about a maximum of 200 \*\*, for example and such a cell 1 can use the generating heat effectively, it is preferred as an object for mount. However, if operating temperature will be 210 \*\*, it will decompose and phosphorus oxide will produce phosphoric acid.

[0012] The air pole 9 and the fuel electrode 10 consist of carbon fiber crossing and catalyst metal (for example, Pt), and each separators 3 and 4 comprise graphitized carbon, stainless steel (that to which corrosion resistance processing was performed is included), etc. Hydrogen (fuel) is supplied to two or more slots 17 into which air consists in the separator 4 by the side of the fuel electrode 10 in two or more slots 16 which consist in the separator 3 by the side of the air pole 9 again, respectively. The sealing member 11 comprises polyimide resin (for example, the Du Pont make, trade name Kapton).

[0013] If constituted as mentioned above, the seal of each peripheral face of the electrolyte 6 therefore both the resin matrix 5, the air pole 9, and the fuel electrode 10 can be carried out by the sealing member 11, and extraction out of the electrode unit 2 of phosphoric acid and evaporation of the moisture in phosphoric acid can be prevented. Since what consists of a low cost material was used rather than the resin matrix 5 as the sealing member 11, high cost-ization of the electrode unit 2 can fully be controlled.

[0014] In formation of the electrode unit 2, as shown in [drawing 3](#), first, it impregnates with the electrolyte 6, therefore phosphoric acid, and the sealing member 11 is inserted in the periphery of both the piled-up resin matrix 5, and the annular projection 13 is inserted between the outer periphery parts a of both the resin matrix 5. Subsequently, by inserting the annular main body part 12 of the electrolyte 6 and the sealing member 11 with the air pole 9 and the fuel electrode 10, and performing a hotpress on condition of 160 \*\* and 4MPa after that, As shown in [drawing 1](#), where the compression set of the outer periphery part a of both the resin matrix 5 is carried out, both \*\*\*\*\* 7 and 8 of the air pole 9 and the fuel electrode 10 and the outer periphery part a of both the resin matrix 5 are joined to the sealing member 11.

[0015] As shown in [drawing 4](#), forming the coating layer 18 of the adhesives which consist of polytetrafluoroethylenes in annular main body part 12 both sides of the sealing member 11 is performed in order to aim at improvement in bonding strength. As this shows [drawing 5](#), the glue line 19 which consists of tetra FUROORO ethylene, respectively exists between the sealing member 11 and both \*\*\*\*\* 7 and 8 of the air pole 9 and the fuel electrode 10.

[0016]

[Effect of the Invention] According to this invention, by constituting as mentioned above, evaporation of the moisture in the phosphoric acid which exists the extraction to the exterior of the phosphoric acid which exists in a resin matrix, and near a resin matrix surface is prevented, and the electrode unit for phosphoric acid fuel cells which controlled high cost-ization can be provided.

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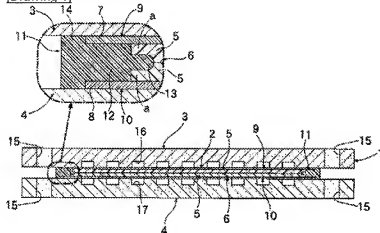
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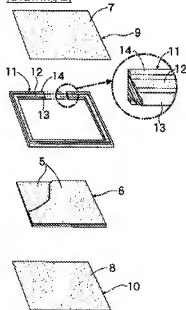
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DRAWINGS

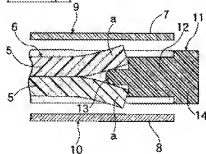
[Drawing 1]



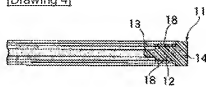
[Drawing 2]



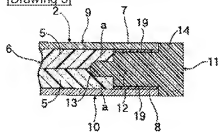
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]